Storey-and-a-half Insulation

Storey-and-a-half attics are a challenge to reinsulate because they have tight and awkward spaces. Figure 1 shows a typical design.

This describes four ways to reinsulate storey-and-a-half attics. None of them may suit your situation exactly; but every reinsulation project has its own problems and opportunities. Adapt an option that works best for your house and budget and follow the basic rules as closely as possible.

1. Try to seal insulated spaces completely airtight. Our solutions use combinations of caulking, weatherstripping and sealed sheets of polyethylene or rigid insulation to do the job. An airtight seal prevents condensation by keeping the warm air in your home from moving through the insulation. Some renovation work is impossible to seal airtight, but it is important to do the best you can.

If you are renovating extensively, consider putting electrical outlets and lights on interior partition walls instead of outside walls. Otherwise, seal these and all other fixtures that penetrate insulated spaces (recessed lights, plumbing stacks, etc.) as well as possible.

2. Install a vapour retarder to prevent moisture from diffusing through insulated spaces. A vapour retarder can be made of any impermeable material such as sheets of polyethylene, or drywall covered with a vapour-retarder or semi-gloss latex paint.

Always put the vapour retarder toward the warm side of an insulated space. It can be on the very inside face of the insulation under the wall finish (it can even be the wall finish). If it is within the insulated space, at least two-thirds of the total insulation value must occur outside it.

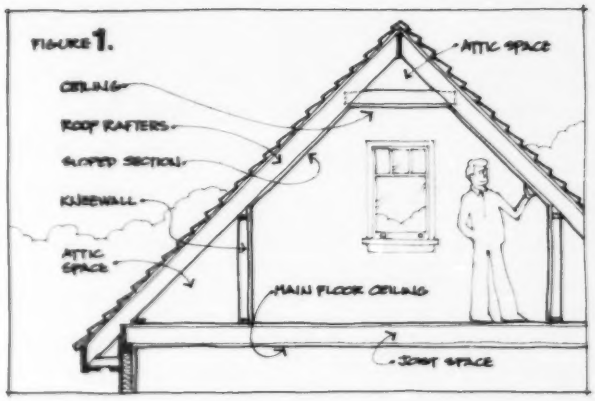


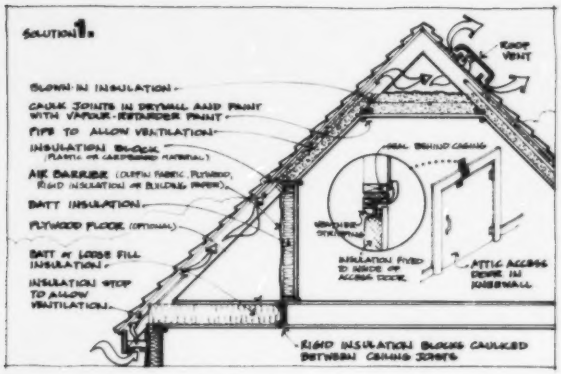
Figure 1

3. At minimum, insulate to fill the space available unless you are deliberately allowing for ventilation. Twenty centimetre (eight inch) floor joists, for example, should be filled with not less than 20 cm (eight inches) of insulation. RSI 7 (R 40) is a good level of insulation for attics, but you may not have enough room in a storey-and-a-half to achieve it. RSI value (R value) refers to the resistance to heat flow - the higher the better. Try to install at least RSI 5.9 (R 34). Aim for RSI 3.5 (R 20) in kneewalls.

4. The Alberta Building Code requires ventilation in all attic spaces. Ventilation will remove moisture that penetrates the insulation (more likely in renovations where an airtight seal is difficult to achieve). Allow one square metre of ventilation area for every 150 square metres of attic (the ventilation areas provided by roof and soffit vents are generally marked on the vents). Ventilation requirements are included for each solution outlined here.

5. Never insulate until you have solved all moisture problems in the attic. Check to make sure the roof is in good repair. There are two approaches to insulating storey-and-a-half attics: insulate along the heated spaces of the attic as in solutions 1 and 2; or along the roof as in solutions 3 and 4. Only solutions 3 and 4 give heated storage space behind the kneewall. There are more or less expensive methods of achieving either solution. The more expensive achieves higher insulation values and better sealing.

Insulating along the heated spaces: Solutions 1 and 2


SOLUTION 1.
ROOF VENT
BLOWN-IN INSULATION
CAULK JOINTS IN DRYWALL AND PAINT WITH VAPOUR-RETARDER PAINT
FIPE TO ALLOW VENTILATION
INSULATION BLOCK
AIR BARRIER
BATT INSULATION
PLYWOOD FLOOR (OPTIONAL)
BATT OR LOOSE FILL INSULATION
INSULATION STOP TO ALLOW VENTILATION
SEAL BEHIND CASING
INSULATION FIXED TO INSIDE OF ACCESS DOOR
ATTIC ACCESS DOOR IN KNEEWALL
RIGID INSULATION BLOCKS CAULKED BETWEEN CEILING JOISTS

Solution 1

These features of solutions 1 and 2 are the same:

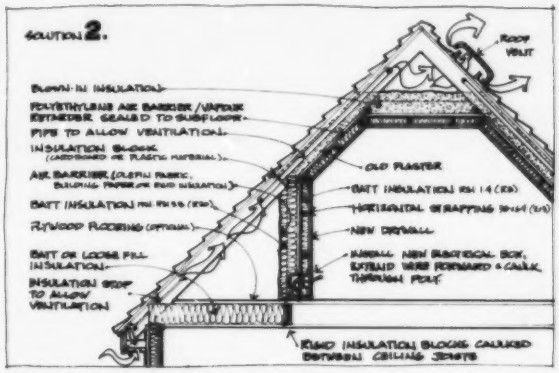
The ceiling and sloped section above the kneewall are insulated with loose fill insulation (cellulose, mineral wool or chopped fibreglass). The kneewall is filled with batts and the joist space with either loose fill or batt insulation. A cardboard or plastic block is installed at the kneewall to hold the loose fill insulation in place.

The insulation in the kneewall can be covered with rigid insulation or an air barrier. Rigid insulation (rigid fibreglass, polyurethane or polystyrene) will add insulation value to the wall. If you use polystyrene or polyurethane, the building code requires that it be covered with a fire-resistant finish such as drywall. A layer of olefin fabric or plywood, sealed at joints and to the top and bottom framing plates of the kneewall, will help control air movement through the wall. Some rigid fibreglass insulation comes with a fabric barrier on one side.

The floor joist behind the kneewall can be covered with plywood to create storage space. Remember that this will be unheated storage space. The access door should be weatherstripped and insulated.

Insulation stops installed at the eaves allow ventilation. Buy vinyl stops or make them yourself out of heavy waxed cardboard. Plastic or heavy cardboard tubes through the sloped section above the kneewall allow ventilation from the eaves to the peak of the roof. The ventilation area should be one square metre for every 300 square metres of the total horizontal area of the attic space. Half the total ventilation area should be shared between the lower attic spaces and half allotted to the upper attic space.

The ceiling of the main floor is used to form an air barrier and vapour retarder. Drywall should be sealed at the edges and painted with a vapour-retarder paint or semi-gloss latex paint. Caulk any cracks in a plaster ceiling.



Solution 2

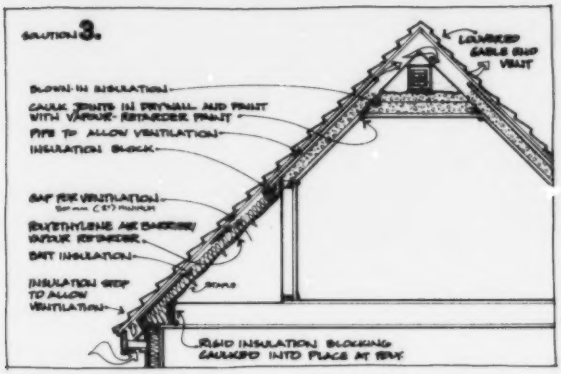
The joist space is sealed with blocks of extruded polystyrene insulation cut to fit between the floor joists just below the kneewall. Caulk these blocks to the joists and to the floor between the joists.

Solutions 1 and 2 differ primarily in the way the kneewall, sloped section and ceiling are sealed. In Solution 1, the interior finish forms an air barrier and vapour retarder. Seal drywall at all joints with caulking or tape and paint with vapour-retarder paint or semi-gloss latex paint. If the finish is plaster, seal any cracks with caulking. Be sure to caulk between the interior finish and the floor (remove the baseboard to do this).

Solution 2 assumes that you plan to replace the interior finish. Install a polyethylene sheet over the existing wall. Seal all joints and caulk the sheet to the floor. Nail strapping over the polyethylene to create a nailing surface for the new finish. Insulate the cavity between the strapping with batt insulation, being careful to keep two-thirds of the total insulation value outside the vapour retarder. Attach the new finish to the strapping.

Insulating along the roof: Solutions 3 and 4

Insulating along the roof makes the area behind the kneewall a heated space. Though both solutions 3 and 4 are examples of this, they represent different ways of achieving it.

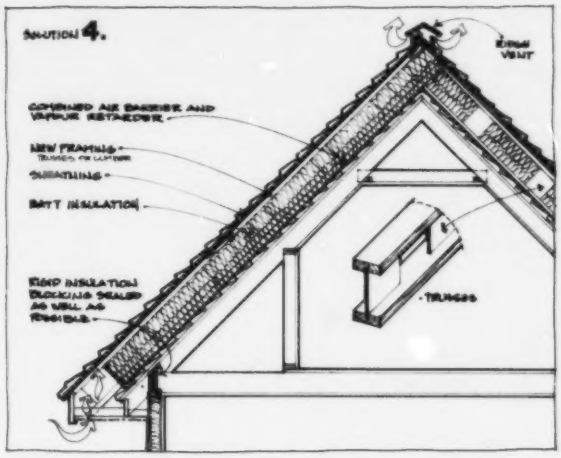

SOLUTION 3.
LOUVERED GABLE END VENT
BLOWN-IN INSULATION
CAULK JOINTS IN DRYWALL AND PRIME WITH VAPOUR RETARDER PAINT
PIPE TO ALLOW VENTILATION
INSULATION BLOCK
GAP FOR VENTILATION
POLYETHYLENE AIR BARRIER/ VAPOUR RETARDER
BATT INSULATION
INSULATION STEP TO ALLOW VENTILATION
RIGID INSULATION BLOCKING CAULKED INTO PLACE AT EAVE

Solution 3

Solution 3 insulates the roof by reframing it. Lay a sheet of polyethylene over the old roofing. Seal the polyethylene at joints and to the edges of the roof. Frame out the roof to allow a total insulation value of at least RSI 7 (R 40) including any insulation already between the rafters. Insulate with batts, making sure that at least two-thirds of the total insulation value is outside the polyethylene. Allow a 50 mm (two inch) gap above the insulation for ventilation (the ventilation area should again be one square metre for every 150 square metres of the total insulated area). Put plywood sheathing and new roofing over the cross-strapping.

To reduce drafts through the joist space, cut extruded polystyrene blocking to fit between the joist headers under the kneewall and caulk them in place. Caulk the bottom framing plate of the kneewall to the floor.

Solution 4 insulates the existing roof rafters. Insulate the sloped section above the kneewall and the ceiling with loose fill insulation as in solutions 1 and 2. Insulate the rafters behind the kneewall with batts, leaving a 50 mm (two inch) gap for ventilation. Install an insulation stop at the eaves to prevent the batts from blocking the soffit vents. The ventilation area should be one square metre to 150 square metres of the total area insulated.



Solution 4

Seal the rafters behind the kneewall with a sheet of polyethylene. Caulk and staple the polyethylene at the bottom to blocks of extruded polystyrene insulation cut to fit between the floor joists where they meet the roof rafters. Caulk these blocks to the joists and to the floor between the joists. Finish the job by sealing the polyethylene to the top framing plate of the kneewall. The interior finish of the sloped section and the ceiling form an air barrier and vapour retarder for the rest of the space. Caulk or tape drywall where it joins and paint it appropriately. Caulk any cracks in the plaster finish with acrylic latex caulk.

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